

We Claim:

1. An improved phosphor structure for a thick dielectric film electroluminescent device, said structure comprising;

- a rare earth activated alkaline earth thioaluminate phosphor thin film layer;

- a silicon oxynitride layer provided directly adjacent the top and/or bottom of said phosphor thin film layer, wherein said silicon oxynitride layer comprises a composition of $\text{Si}_3\text{N}_x\text{O}_y\text{H}_z$ where $2 \leq x \leq 4$, $0 < y \leq 2$ and $0 \leq z \leq 1$.

2. The structure of claim 1, wherein said phosphor thin film layer is represented by $\text{AB}_x\text{C}_y:\text{RE}$ wherein

A is at least one of Mg, Ca, Sr or Ba;

B is at least one of Al, Ga or In;

C is at least one of S or Se; and

$2 \leq x \leq 4$ and $4 \leq y \leq 7$.

3. The structure of claim 2, wherein RE is one or more rare earth activator species selected from the group consisting of Eu or Ce.

4. The structure of claim 3, wherein said phosphor is barium thioaluminate with a ratio of aluminum to barium between 2-4.

5. The structure of claim 3, wherein said phosphor is magnesium barium thioaluminate with a ratio of the atomic concentration of magnesium to barium plus magnesium is in the range 0.001 to 0.2.

6. The structure of claim 3, wherein the phosphor is activated with trivalent europium or cerium and the atomic ratio of europium or

cerium to barium or barium plus magnesium is in the range of about 0.005 to about 0.04.

7. The structure of claim 3, wherein the phosphor is activated with trivalent europium or cerium and the atomic ratio of europium or cerium to barium or barium plus magnesium is in the range of about 0.015 to 0.03.

8. The structure of claim 3, wherein said phosphor may additionally comprise up to about 25 atomic percent oxygen.

9. The structure of claim 1, wherein said silicon oxynitride layer has a thickness of about 30 nm to about 70 nm.

10. The structure of claim 9, wherein said structure comprises a silicon oxynitride layer on the top of said phosphor thin film layer and a silicon oxynitride layer on the bottom of said phosphor thin film layer.

11. The structure of claim 9, wherein said structure comprises a silicon oxynitride layer on the top of said phosphor thin film layer.

12. The structure of claim 9, wherein said structure comprises a silicon oxynitride layer on the bottom of said phosphor thin film layer.

13. The structure of claim 9, wherein said silicon oxynitride layer comprises a composite material containing two or more silicon oxynitride compositions having different values of x, y and z.

14. The structure of claim 1, wherein said silicon oxynitride layer is deposited by sputtering.

15. The structure of claim 14, wherein sputtering is conducted in a low pressure nitrogen atmosphere where the ratio of argon to nitrogen is within the range of about 4:1 to 1:1 and the working pressure is maintained within the range of about 8×10^{-4} mbar to 6×10^{-3} mbar.

16. The structure of claim 1, wherein said silicon oxynitride layer is adhered to the phosphor thin film structure.

17. A thick film dielectric electroluminescent device comprising;
- a thin thioaluminate phosphor layer of formula $AB_xC_y:RE$ where A is at least one of Mg, Ca, Sr or Ba, B is at least one of Al, Ga or In and C is at least one of S or Se, $2 \leq x \leq 4$ and $4 \leq y \leq 7$ and Re is selected from terbium and europium; and
- a passivating silicon oxynitride layer provided directly adjacent the top and/or bottom of said phosphor thin film layer, wherein said silicon oxynitride layer comprises a composition of $Si_3N_xO_yH_z$ where $2 \leq x \leq 4$, $0 < y \leq 2$ and $0 \leq z \leq 1$.

18. The device of claim 17, wherein said phosphor is barium thioaluminate with a ratio of aluminum to barium between 2 to 4.

19. The device of claim 17, wherein said phosphor is magnesium barium thioaluminate with a ratio of the atomic concentration of magnesium to barium plus magnesium is in the range of about 0.001 to 0.2.

20. The device of claim 17, wherein the atomic ratio of europium or cerium to barium or barium plus magnesium is in the range of about 0.005 to about 0.04.

21. The device of claim 17, wherein the atomic ratio of europium or cerium to barium or barium plus magnesium is in the range of about 0.015 to 0.03.

22. The device of claim 17, wherein said phosphor may additionally comprise up to about 25 atomic percent of oxygen.

23. The device of claim 17, wherein said silicon oxynitride layer has a thickness of about 30 nm to about 70 nm.

24. The device of claim 23, wherein said structure comprises a silicon oxynitride layer on the top of said phosphor layer and a silicon oxynitride layer on the bottom of said phosphor layer.

25. The device of claim 23, wherein said structure comprises a silicon oxynitride layer on the top of said phosphor layer.

26. The device of claim 23, wherein said structure comprises a silicon oxynitride layer on the bottom of said phosphor layer.

27. The device of claim 23, wherein said silicon oxynitride layer comprises a composite material containing two or more silicon oxynitride compositions having different values of x, y and z.

28. The device of claim 17, wherein said silicon oxynitride layer is deposited by sputtering.

29. The device of claim 28, wherein sputtering is conducted in a low pressure nitrogen atmosphere where the ratio of argon to nitrogen is within the range of about 4:1 to 1:1 and the working pressure is maintained within the range of about 8×10^{-4} mbar to 6×10^{-3} mbar.

30. The device of claim 17, wherein said silicon oxynitride layer is adhered to the phosphor film.

31. A phosphor laminate for use in a thick film dielectric electroluminescent display, said laminate comprising;

- a rare earth activated alkaline earth thioaluminate phosphor thin film layer;

- a silicon oxynitride layer provided directly adjacent the top of said phosphor thin film layer, wherein said silicon oxynitride layer comprises a composition of $\text{Si}_3\text{N}_x\text{O}_y\text{H}_z$ where $2 \leq x \leq 4$, $0 < y \leq 2$ and $0 \leq z \leq 1$.

32. The laminate of claim 31, wherein said phosphor thin film layer is represented by $\text{AB}_x\text{C}_y:\text{RE}$ wherein

A is at least one of Mg, Ca, Sr or Ba;

B is at least one of Al, Ga or In;

C is at least one of S or Se; and

$2 \leq x \leq 4$ and $4 \leq y \leq 7$.

33. The laminate of claim 32, wherein RE is one or more rare earth activator species selected from the group consisting of Eu or Ce.

34. The laminate of claim 33, wherein said phosphor is barium thioaluminate with a ratio of aluminum to barium between 2-4.

35. The laminate of claim 34, wherein said phosphor is magnesium barium thioaluminate with a ratio of the atomic concentration of magnesium to barium plus magnesium is in the range 0.001 to 0.2.

36. The laminate of claim 34, wherein the phosphor is activated with trivalent europium or cerium and the atomic ratio of europium or

cerium to barium or barium plus magnesium is in the range of about 0.005 to about 0.04.

37. The laminate of claim 34, wherein the phosphor is activated with trivalent europium or cerium and the atomic ratio of europium or cerium to barium or barium plus magnesium is in the range of about 0.015 to 0.03.

38. The laminate of claim 33, wherein said phosphor may additionally comprise up to about 25 atomic percent oxygen.

39. The laminate of claim 32, wherein said silicon oxynitride layer has a thickness of about 30 nm to about 70 nm.

40. The laminate of claim 39, wherein said laminate comprises a silicon oxynitride layer on the top of said phosphor thin film layer and a silicon oxynitride layer on the bottom of said phosphor thin film layer.

41. The laminate of claim 39, wherein said laminate comprises a silicon oxynitride layer on the top of said phosphor thin film layer.

42. The laminate of claim 41, wherein said laminate comprises a silicon oxynitride layer on the bottom of said phosphor thin film layer.

43. The laminate of claim 39, wherein said silicon oxynitride layer comprises a composite material containing two or more silicon oxynitride compositions having different values of x, y and z.

44. The laminate of claim 32, wherein said silicon oxynitride layer is deposited by sputtering.

45. The laminate of claim 44, wherein sputtering is conducted in a low pressure nitrogen atmosphere where the ratio of argon to nitrogen is within the range of about 4:1 to 1:1 and the working pressure is maintained within the range of about 8×10^{-4} mbar to 6×10^{-3} mbar.

46. The laminate of claim 31, wherein said silicon oxynitride layer is adhered to the phosphor thin film structure.